



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/685,481	10/10/2000	Dz Ching Ju	ST9-95-010US2	6724
22462	7590	03/11/2004	EXAMINER	
GATES & COOPER LLP HOWARD HUGHES CENTER 6701 CENTER DRIVE WEST, SUITE 1050 LOS ANGELES, CA 90045			VO, TED T	
			ART UNIT	PAPER NUMBER
			2122	

DATE MAILED: 03/11/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/685,481

Applicant(s)

JU ET AL.

Examiner

Ted T. Vo

Art Unit

2122

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 10 October 2000.
- 2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-18 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-18 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date 5.
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____.

Art Unit: 2122

DETAILED ACTION

1. This action is in communication to the filing Continuation Application under 37 C.F.R. 1.53(b), dated on 10/10/2000, and the Preliminary Amendment, dated on 10/10/2000.

The specification at page 3 is amended as requested in the filing Continuation Application.

Claims 1-3, 5-9, 11-15, and 17-18 are amended as requested in the filing Preliminary Amendment.

Claims 1-18 are pending in the application.

Specification

2. The abstract of the disclosure is objected to because content of the abstract exceeds more than 150 words in length. Correction is required. See MPEP § 608.01(b).

The Drawings are included with Figure 6, Figure 6a, and Figure 6b. However, the Brief Description Of The Drawings (Page 11) fails to give brief descriptions of Figure 6a and Figure 6b. It requires amending the specification to include the brief descriptions of Figure 6a and Figure 6b. See MPEP § 608.01(f).

Double Patenting

3. The nonstatutory double patenting rejection is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or improper timewise extension of the "right to exclude" granted by a patent and to prevent possible harassment by multiple assignees. See *In re Goodman*, 11 F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); *In re Longi*, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985); *In re Van Omum*, 686 F.2d 937, 214 USPQ 761 (CCPA 1982); *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970); and, *In re Thorington*, 418 F.2d 528, 163 USPQ 644 (CCPA 1969).

A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) may be used to overcome an actual or provisional rejection based on a nonstatutory double patenting ground provided the conflicting application or patent is shown to be commonly owned with this application. See 37 CFR 1.130(b).

Art Unit: 2122

Effective January 1, 1994, a registered attorney or agent of record may sign a terminal disclaimer. A terminal disclaimer signed by the assignee must fully comply with 37 CFR 3.73(b).

4. Claims 1-18 are rejected under the judicially created doctrine of obviousness-type double patenting as being respectively unpatentable over claims 1-5 of U. S. Patent No. 6,175,957 B1. Although the conflicting claims are not identical, they are not patentably distinct from each other because:

As per Claim 1:

Claim 1 recites steps in which the claim limitations have functionality corresponding to the steps in the claim 1 of the US Patent, No. 6,175,957 B1.

Comparing the recited steps a, b, and c of Claim 1 and the steps a, b, and c of the claim 1 of the US 6,175,957 B1 (column 12, lines 40-65), the limitations of these two claims are not patentably distinct.

As per Claim 2:

Comparing the recited steps d, e, f, and g of Claim 2 and the steps d, e, f, and g of the claim 1 of the US 6,175,957 B1 (Started at columns 12, line 66 to column 13, line 18), the limitations of these two claims are not patentably distinct.

As per Claim 3:

Comparing the recited steps h and i of Claim 3 and the steps h and i of the claim 2 of the US 6,175,957 B1 (column 13, lines 19-23), the limitations of these two claims are not patentably distinct.

As per Claim 4:

Comparing the recited limitation of Claim 4 and the claim 3 of the US 6,175,957 B1 (column 13, lines 24-25), the limitations of these two claims are not patentably distinct.

As per Claim 5:

Comparing the recited limitation of Claim 5 and the claim 4 of the US 6,175,957 B1 (column 13, lines 26-30), the limitations of these two claims are not patentably distinct.

As per Claim 6:

Comparing the recited limitation of Claim 6 and the claim 5 of the US 6,175,957 B1 (column 13, lines 31-35), the limitations of these two claims are not patentably distinct.

Art Unit: 2122

As per Claims 7-12:

Claims 7-12 are claiming an article of manufacture for use in which each claim has the limitation corresponding to the limitation of Claims 1-6 respectively. Therefore, they have the same double patenting subjected as reasoned in connecting to the double patenting set forth in Claims 1-6.

As per Claims 13-18

Claims 13-18 are claiming a computer system in which each claim has the limitation corresponding to the limitation of Claims 1-6 respectively. Therefore, they have the same double patenting subjected as reasoned in connecting to the double patenting set forth in Claims 1-6.

Claim Rejections - 35 USC § 103

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

A person shall be entitled to a patent unless –

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

6. Claim 1, 4, 7, 10, 13, and 16 are rejected under 35 U.S.C. 103(a) as being unpatentable over Pettis et al, (hereafter: Pettis), "Profile Guided Code Positioning" ACM 1990 in view of Tomko et al, (hereafter: Tomko), "Profile Driven Weight Decomposition", ACM 1996.

Art Unit: 2122

Given the broadest reasonable interpretation of followed claims in light of the specification.

As per claim 1:

Pettis discloses a method for constructing an undirected weighted graph. The constructing graph is partitioned into sub-graph due to the edge weights and the size of a procedure (basic block).

The teaching cover the claim limitation hereafter:

a) constructing a Program Execution Graph (PEG) corresponding to a first level of the memory hierarchy (Page 16, right column, lines 27-32) from control flow and frequency information from a profile of the program, the PEG comprising a weighted undirected graph comprising nodes and edges

each node representing a basic block, each edge representing a transfer of control between a pair of the basic blocks (Page 17, right column, see section 3.2, 'each node of the graph is a single procedure and the edges correspond to calls between procedure'. 'A single procedure' is also referred as a basic block – page 21, right column, section 5), each of the nodes having a weight equal to the size of the basic block represented by the node and each of the edges having a weight equal to a frequency of transition between a pair of basic blocks (See page 17, right column, section 3.2, 'the edges correspond to calls between procedure') represented by a pair of nodes connected by the edge;

b) for the first level of the memory hierarchy, partitioning the nodes of the PEG into clusters, such that a sum of weights of the edges whose endpoints are in different clusters is minimized (See page 21, left column fourth paragraph, referring to the partition: A, E-N-B-C-D-F-H, I-J-L, G-O, K, M' partitioned from the graph of Figure 4 in page 20), and such that, for any cluster, a sum of weights of the nodes in the cluster is no greater than an upper bound corresponding to a size of the first level of the memory hierarchy;

c) restructuring the basic blocks into contiguous code corresponding to the clusters, such that the basic blocks that communicate extensively with each other are on a same level of the memory hierarchy, in order to reduce communications between the basic blocks across the levels

Art Unit: 2122

of the memory hierarchy (Page 21, see entirely section 4.3, Basic Block Placement, *'the final phase is to restructure the basic block graph before passing to the actual optimizer'*).

Pettis does not explicitly include the "node weights"; however, Pettis does teach about basic block splitting for minimizing the size of the basic block; thus it balances pages and accounts for cache misses (Page 21, right column, section 5. Procedure Splitting, see second paragraph, referring to *'Procedure Splitting is process of separating the fluff basis blocks of a procedure into a separate region in attempt to minimize the size of the primary procedure'*).

Tomko discloses a graph that is included with vertex weights (node weights) and edge weights for use with graph partitioning (Re Tomko: page 165, right column, first paragraph). It discloses a method for partitioning the vertices (nodes) into the number of disjoint subset so that the sum of the vertex weights for the subset with the highest sum is close to the average sum, and the total cost of the cut edge is minimized (Re Tomko: page 166, left column, section 3, Domain Decomposition, third paragraph, "The weighted graph partitioning...").

Therefore, it would have been obvious to a person of ordinary skill in the art at the time of invention was made to combine the teaching of Pettis: *Partitioning weighted graph where the weights are in the edges*, with the teaching of Tomko: *Partitioning the weighted graph where the weights are with the vertices and edges*. Doing so would yield balance loading and conform to the size limitation of certain memory/register resources, thus would improve the performance of compilations for profiling.

As per claim 4:

With regard to ***"The method of claim 1 wherein the upper bound is a multiple of a size of a level of the memory hierarchy"***, in light of the specification (re: Specification: page 6, line 7-11),

Pettis and Tomko do not explicitly address such limitation: ***"a multiple of a size of a level of the memory hierarchy"***.

However, Pettis suggests a minimized size of splitting procedure (basic block) so that more procedures (basic blocks) can be packed into a single page in the reduction of page and TBL misses (Page 21 and 22, see entire section 5. Procedure Splitting; particularly, see second paragraph in section 5, page 21, and Figure 5 in page 22), and

Tomko suggests that with a given weighted graph, it is partitioned into disjoint subsets such that sum of the vertex weights for the subset with the highest sum is close to the average sum, and the total cost of the cut edges is minimized (Re Tomko: page 166, left column, section 3, Domain Decomposition, third paragraph, "The weighted graph partitioning...")

Therefore, it would have been obvious to a person of ordinary skill in the art at the time of invention was made to include such an *upper bound that is multiple of a size* in the teaching of Pettis: *Partitioning weighted graph where the weights are in the edges*, and the teaching of Tomko: *Partitioning the weighted graph where the weights are with the vertices and edges*. Doing so would be conforming to the balance loading due to size limitation of certain memory/register resources.

As per Claim 7:

Claim 7 is claiming an article of manufacture for use in which the claim has the limitation corresponding to the limitation of Claim 1. Therefore, Claim 7 is rejected in the same reason set forth in connecting to the rejection of Claim 1.

As per Claim 10:

Claim 10 is claiming an article of manufacture for use in which the claim has the limitation corresponding to the limitation of Claim 4. Therefore, Claim 10 is rejected in the same reason set forth in connecting to the rejection of Claim 4.

As per Claim 13:

Claim 13 is claiming a computer system in which the claim has the limitation corresponding to the limitation of Claim 1. Therefore, Claim 13 is rejected in the same reason set forth in connecting to the rejection of Claim 1.

As per Claim 16:

Claim 16 is claiming a computer system in which the claim has the limitation corresponding to the limitation of Claim 4. Therefore, Claim 16 is rejected in the same reason set forth in connecting to the rejection of Claim 4.

Allowable Subject Matter

7. Claims 2, 8, 14 are objected to (regarding the closest arts of record, Pettis and Tomko) as being dependent upon a rejected base claim, **but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims, and provided with filing terminal disclaimer** (It is noted that Claims 1-18 are rejected under double patenting (as given in sections 3 and 4 above).

Regarding claim limitation: "*d) for a next level of the memory hierarchy, constructing a next PEG from the clusters of the partitioned PEG, such that a node in the next PEG corresponds to a cluster in the partitioned PEG, and such that there is an edge between two nodes in the next PEG if there is an edge between components of the clusters represented by the two nodes;*

e) assigning a weight to each node of the next PEG;

f) assigning a weight to an edge between a pair of nodes of the next PEG representing a pair of clusters of the partitioned PEG, the edge weight being a summation of weights of edges in the partitioned PEG having endpoints in the pair of clusters in the partitioned PEG; and

g) partitioning the nodes of the next PEG into clusters, such that a sum of weights of the edges whose endpoints are in different clusters is minimized, and such that, for any cluster, a sum of weights of the nodes in the cluster is no greater than an upper bound corresponding to a size of a next level of the memory hierarchy", and in as such manners as recited in Claims 2, 8, and 14:

Pettis and Tomko, priors of record, do not explicitly disclose the combination the steps d, e, f, and g for a next level in constructing such a graph.

8. Claims 3, 5-6, Claims 9, 11-12, and Claims 15, 17-18, are dependent on Claims 2, 8, 14, respectively. Therefore, these claims are also objected to (Examiner note: Claims 3, 5-6, 9, 11-12, 15, 17-18 remain rejected under double patenting issue).

Art Unit: 2122

Conclusion

9. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Lorito et al, EP No. 0 881 568 A2, discloses a method for partitioning control functions started with weighted graph containing nodes and arcs.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Ted T. Vo whose telephone number is (703) 308-9049. The examiner can normally be reached on Monday-Friday from 8:00 AM to 5:30 PM ET. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Tuan Dam, can be reached on (703) 305-4552.

The fax phone numbers:

(703) 872-9306 (for formal communication intended for entry);

(703) 746-5429 (for informal or draft communication, please label "PROPOSED" or "DRAFT").

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the Group receptionist whose telephone number is (703) 305-3900.

TED T. VO

Patent Examiner
Art Unit: 2122
March 2, 2004